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**FOR: JONATHAN WOODSON, M.D., ASSISTANT SECRETARY OF DEFENSE
(HEALTH AFFAIRS)**

**SUBJECT: Needle Decompression of Tension Pneumothorax and Cardiopulmonary
Resuscitation Tactical Combat Casualty Care Guideline Recommendations
2011-08**

EXECUTIVE SUMMARY

The Committee on Tactical Combat Casualty Care (CoTCCC), a work group of the Defense Health Board (DHB) Trauma and Injury Subcommittee, reviewed recent evidence and feedback from theater regarding issues pertaining to tension pneumothorax. Needle decompression (ND) following traumatic cardiac arrest may be lifesaving if an unsuspected tension pneumothorax is present. Current TCCC Guidelines for Tactical Field Care indicate that battlefield cardiopulmonary resuscitation (CPR) will not be successful and should not be attempted for either blast or penetrating trauma casualties with no vital signs.

The Board has issued recommendations to the Department amending current TCCC Tactical Field Care Guidelines to include performing bilateral ND for any casualty in cardiorespiratory arrest with known or suspected chest trauma. The Board also recommended the Department include these changes to tactical evacuation (TACEVAC) guidelines, as well. In light of current practice in theater, the DHB approved the recommendation that CPR be added to the TACEVAC guidelines as an optional intervention, if the casualty did not incur obviously fatal wounds and would be arriving within a short period of time at a medical treatment facility with surgical capability. However, CPR should not be performed at the expense of compromising the mission or denying lifesaving care to other casualties.

BACKGROUND

TCCC is a set of trauma care guidelines customized for use in the prehospital combat setting and employed by Department of Defense Services and many U.S. coalition partners in medic training.¹ The CoTCCC performs a quarterly review of current evidence that demonstrates the successes and shortcomings of the TCCC Guidelines, and considers proposed updates and revisions.²

The CoTCCC held several meetings between November 2010 and August 2011, during which members examined the effectiveness of ND for pulseless casualties with torso trauma. Members received briefings from the Expeditionary Combat Readiness Center, Department of Combat Medic Training Fort Sam Houston, and the Naval Medical Research Unit -- San Antonio. Feedback was also received from combat medics and trauma surgeons recently returned from the field.³⁻⁵

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On August 3, 2011, the Trauma and Injury approved the recommendations regarding TCCC Guidelines for ND and CPR. On August 8, 2011, the Board approved the recommendations by unanimous vote.⁶

DISCUSSION

Needle Decompression and CPR for Pulseless Trauma Casualties

In civilian trauma settings, evacuation of tension pneumothoracies in the prehospital setting has been shown to be effective with improved clinical status noted in up to 54% treated with ND.⁷ However, there is limited data regarding the use of ND in pulseless trauma casualties let alone in combat settings. The loss of central pulses and the cessation of respiratory effort following blunt or penetrating chest trauma is multi-causal to include tension pneumothorax. Most of these casualties will succumb from their injuries however a small proportion may be saved.⁸ Anecdotal evidence suggest a role for ND in pulseless casualties. In a recent case presented during a Joint Theater Trauma System video teleconference, ND was responsible for saving the life of a casualty in traumatic cardiac arrest.⁹ In addition to reports received from theater, autopsies conducted by the Office of the Armed Forces Medical Examiner have identified casualties with postmortem evidence of a tension pneumothorax who did not receive ND.⁶

Most of the studies supporting ND following traumatic cardiac arrest are limited to retrospective designs. One study included a series of 757 patients enrolled in a civilian trauma data base with traumatic cardiopulmonary arrest following primarily blunt vs. penetrating trauma. Tension pneumothorax occurred in 5.7% of the patients. Of the 415 patients who received CPR in the prehospital vs. emergency room setting, survival was 19.5%. Prehospital insertion of a chest tube by the on-scene trauma physician also had a significant positive impact on survival (OR 0.3, 95% CI 0.13-0.8). This study had substantial selection bias due to the ability of the on-scene physician to declare a casualty dead precluding the initiation of resuscitative efforts or entry into the data base. Nonetheless, it does strongly suggest the merits of both the initiation of CPR and chest decompression in the face of traumatic cardiac arrest. A retrospective study of 20,330 advanced life support paramedic calls, 12 patients suffering traumatic arrest were treated with bilateral ND. Three of these 12 patients had a return of cardiac output following ND.¹⁰ In one small retrospective study involving 37 civilian trauma patients with prehospital cardiac arrest, 46% underwent chest decompression (17 thoracostomy, 1 ND), with a return of cardiac output in four patients.¹¹ In another retrospective study, 75 trauma patients were identified who received ND over a 4 year period. Twenty six of the patients that received ND were pulseless; with 34.6% or 9 patients showing clinical improvement.¹² In a prospective study of trauma patients treated at a multinational medical unit at Kandahar Airfield Base in Afghanistan, it was uncertain if ND saved lives or failure to do so resulted in excess mortality. However, the authors did go on to recommend that for combat trauma casualties with an absent pulse, bilateral ND should be performed due to the potential benefit and clear absence of additional harm.¹³

Current TCCC Guidelines for Cardiopulmonary Resuscitation and Needle Decompression

Current Tactical Field Care Guidelines and Tactical Evacuation Guidelines limit needle decompression or chest tube insertion to casualties with progressive respiratory distress and known or suspected torso trauma in whom a tension pneumothorax is suspected. In regards to CPR, Tactical Field Care Guidelines state: "CPR resuscitation on the battlefield for victims of blast or penetrating trauma who have no pulse, no ventilation, and no other signs of life will not be successful and should not be attempted."¹ There are no current guidelines for CPR resuscitation during TACEVAC.

Cardiopulmonary Resuscitation During Tactical Evacuation Care

Anecdotal reports from theater have indicated a number of survivors among casualties previously in cardiac arrest, who arrived at treatment facilities with CPR in progress.⁶ A case reviewed during a March 2011 JTTS VTC involved a patient who incurred closed head trauma and loss of consciousness following an improvised explosive device attack. During the prehospital phase, vital signs were lost. CPR and bilateral ND were performed upon arrival at the hospital, resulting in the return of vital signs.⁴

A prospective observational study examined the outcomes of 52 casualties with traumatic cardiac arrest who were received at a military trauma hospital in Helmand Province, Afghanistan, between November 29, 2009 and June 13, 2010.⁸ Compared to civilian settings, these casualties suffered more severe injuries. Survival to hospital discharge was 8% with no survivors receiving CPR prior to TACEVAC. One survivor who required 24 minutes of CPR during the evacuation went on to survive with good neurological recovery.⁸ CPR prior to TACEVAC is not only likely to be futile, it also places the rescuers in harm's way. However, additional medical interventions (such as CPR) could be provided during TACEVAC for some casualties without fatal wounds, due to decreased hostile threat and increased capabilities relative to the Tactical Field Care phase.¹⁴ The number of unexpected survivors who received CPR during TACEVAC necessitated a review of the current TCCC Guidelines for CPR, as they currently do not include recommendations during this phase of care.¹⁵

RECOMMENDATIONS

The Board recommends DoD incorporate the following additions to the TCCC Guidelines for Traumatic Cardiac Arrest and Needle Decompression (proposed additions are italicized within the excerpt below):

Tactical Field Care:

- 17. Cardiopulmonary Resuscitation (CPR): Resuscitation on the battlefield for victims of blast or penetrating trauma who have no pulse, no ventilations, and no other signs of life will not be successful and should not be attempted. *However, casualties with torso trauma or polytrauma who have no pulse or respirations during TFC should have***

bilateral needle decompression performed prior to discontinuation of care to ensure they do not have a tension pneumothorax. This procedure is the same as described in section 3 above.

Tactical Evacuation Care:

16. Cardiac Arrest During TACEVAC

- a. Casualties with torso trauma or polytrauma who have no pulse or respirations during TACEVAC should have bilateral needle decompression performed to ensure they do not have a tension pneumothorax. The procedure is the same as described in section 2 above.*
- b. CPR may be attempted during this phase of care if the casualty does not have obviously fatal wounds and will be arriving at a facility with a surgical capability within a short period of time. CPR should not be done at the expense of compromising the mission or denying lifesaving care to other casualties.*

The above recommendations were unanimously approved.

FOR THE DEFENSE HEALTH BOARD:



Nancy W. Dickey, M.D.
DHB President



Donald Jenkins, M.D.
Chair, Trauma and Injury Subcommittee

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3. Presentation: Life Saving Interventions Performed by Medics in the Combat Zone, to the Committee on Tactical Combat Casualty Care, November 16, 2010, by Major Julio R. Lairer, Expeditionary Combat Readiness Center.
4. Presentation: Tension Pneumothorax, to the Committee on Tactical Combat Casualty Care, August 2, 2011, by Mr. Donald L. Parsons, Department of Combat Medic Training, Fort Sam Houston.
5. Presentation: TCCC from the Level III, to the Committee on Tactical Combat Casualty Care, February 8, 2011, by LCDR Chris Burns, Naval Medical Research Unit – San Antonio.
6. Presentation: Filling in the Gaps: Proposed Updates to the Tactical Combat Casualty Care Guidelines, to the Defense Health Board, August 8, 2011, by Dr. Donald Jenkins, Trauma and Injury Subcommittee Chair.
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